# The ATLAS/TILECAL Detector Control System

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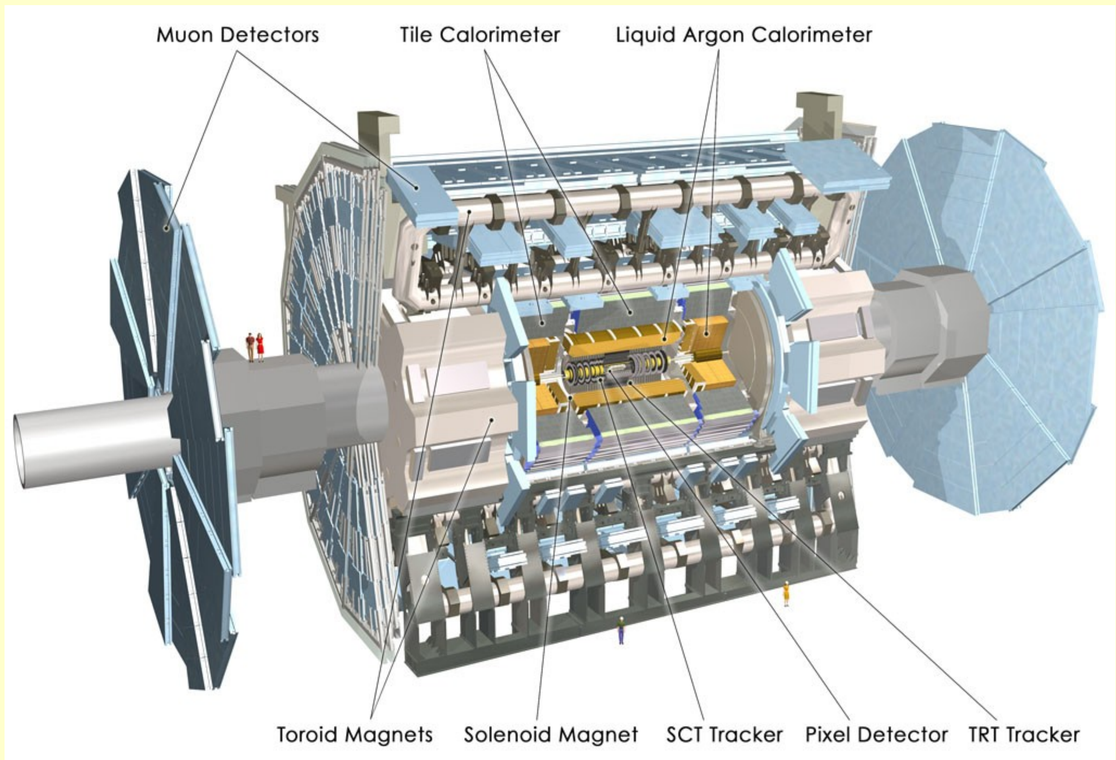
TILECAL module

TILECAL is composed of 3 cylinders, one central barrel and two extended barrels with each cylinder composed of 64 modules.




**Back-end (Software):**

- Distributed **S**upervisory **C**ontrol **A**nd **D**ata **A**cquisition system (**SCADA**) running on PCs
- SCADA system **PVSSII** commercial program from Austrian company **ETM**

**Front-end (electronics):**

- **PLC's** (**P**rogrammable **L**ogical **C**ontroller)
  - HV micro boards and HV opto boards
- **ELMB** (**E**mbedded **L**ocal **M**onitor **B**oard)

**Field bus**

- CANbus (**C**ontroller **A**rea **N**etwork)
  - MODbus

**Communication Protocols**

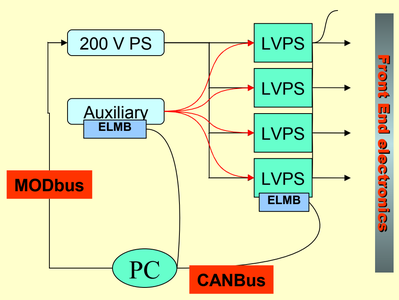
- DIM (Distributed Information Management)
- OPC (OLE for Process Control)

## CUSTOM-MADE COMPONENTS FOR THE DCS

- a new firmware for the ELMB (non-ATLAS standard)
- Several PVSS scripts for control of the low voltage power supplies (examples: majority for temperatures probes; automatic retrieving of data for off-line analysis)
- All control and security of low voltages power supplies (software interlocks)
- All High Voltage Control system (photomultiplier's voltage control) implementation of a DIM server

### LOW VOLTAGE CONTROL

- LVPS 8 Output voltages
- Auxiliary Boards control the LVPS
- Equipment:
  - 256 LVPS
  - 64 Auxiliary Boards
    - ~2000 canais AO
    - ~16000 canais AI
    - 10 between readings




## TILECAL DCS MAIN SYSTEMS

**HIGH VOLTAGE** (HV) – power supplies the Photomultiplier's (400 to 1000 V) - monitoring of the voltages and temperatures

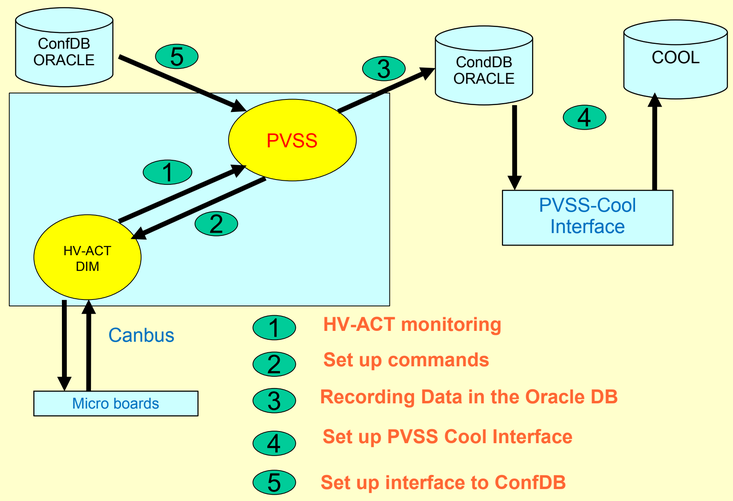
**LOW VOLTAGE** (LV) – supplies power to HV distributor, Digitizers and Motherboard (eight voltages from 3 to 15V) – DCS monitors voltages, currents and temperatures using Embed Local Monitor Board (ELMB). DCS also provides control of the system.

**COOLING** – cooling for both Low voltage and High Voltage systems - DCS monitors temperatures and pressures in cooling sectors. Also provides monitoring of temperatures inside LV and HV system.

**CESIUM**
**LASER**

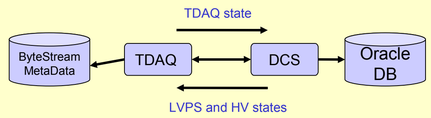
} **Calibration systems with their own control**

### HIGH VOLTAGE CONTROL

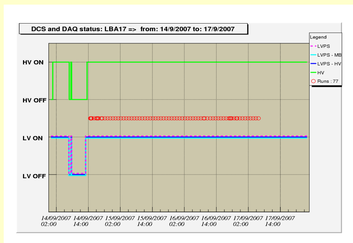



### DAQ DCS COMMUNICATION (DDC)

Mechanism to exchange information between TDAQ and DCS based on DIM across Windows and Linux



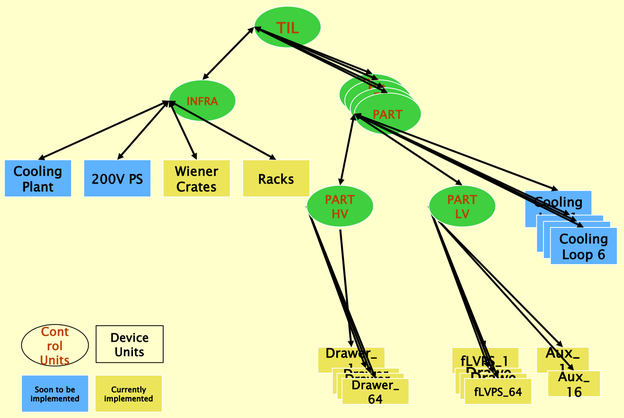

DAQ - DCS Data Flow




Example graph from DCS web interface showing activities of DCS and TDAQ

## Finite State Machine (FSM)

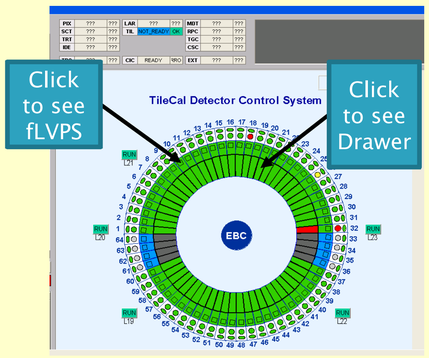
FSM will be extensively used in ATLAS DCS. It allows, among other, automatic detector operations, single subsystem operations and integration of the control in the ATLAS DCS.

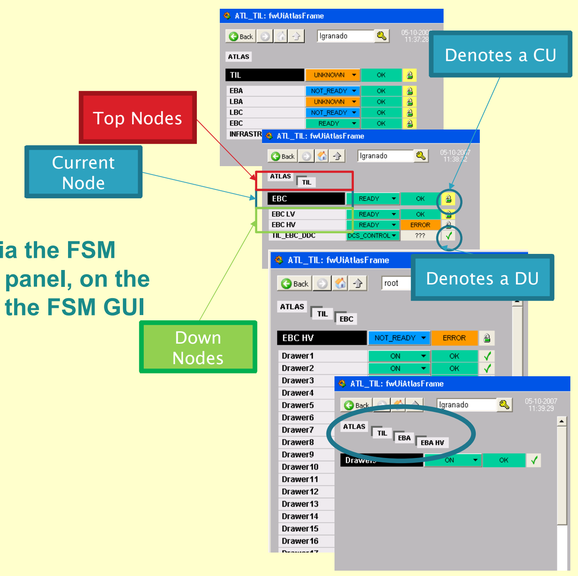



The TILECAL FSM hierarchy

The basic FSM elements are Device Unit (DU) and Control Unit (CU). The DU provides the interface with the hardware, the CU (with a complex control program) integrates the DUs in the hierarchy.

### FSM NAVIGATION




- Navigate via the FSM navigation panel, on the left side of the FSM GUI

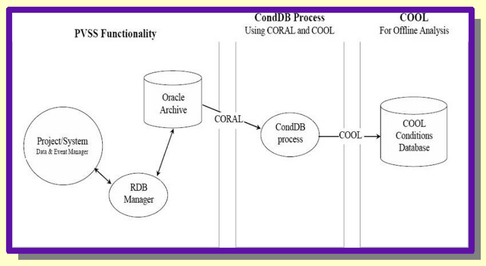
## Data Storing

The TILECAL DCS will use three types of databases:

**CONDITIONS DATABASE**: PVSS ORACLE DATABASE - database to store data that is relevant for understanding detector behaviour

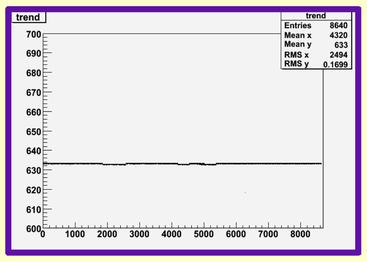
**COOL DATABASE**: database that will store data that is relevant for off-line physics analysis

**CONFIGURATION DATABASE:** ORACLE database to store settings (like output values, alert limits), system structure (lists and hierarchies of devices), device properties (like configuration of archiving, smoothing, etc.)




PVSS to COOL Data Flow

Shift on LBC11 HV pmt 38 June 15th 2007




LBC11 HV pmt 38
Δ max = 0.6 V
r.m.s = 0.20 V